USING THE NATIONAL STREAMGAGE NETWORK TO ESTIMATE STREAMFLOW AT UNGAGED LOCATIONS

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WHAT ARE WE TRYING TO ESTIMATE?

<u>Streamflow statistics</u>

Examples:

- 7Q10
- 1% AEP flood (100-year flood)
- Mean annual flow

<u>Streamflow time series</u>

Examples:

- Daily streamflow
- Peak flow hydrograph

Temporal and spatial scales – a continuum of interests

Temporal resolution

coarse **fine**

Long term means

Annual statistics

Daily timestep

Sub-hourly timestep

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Temporal and spatial scales – a continuum of interests

Spatial resolution

coarse **fine**

Regional averages

Large watersheds

Small watersheds

10-meter grid

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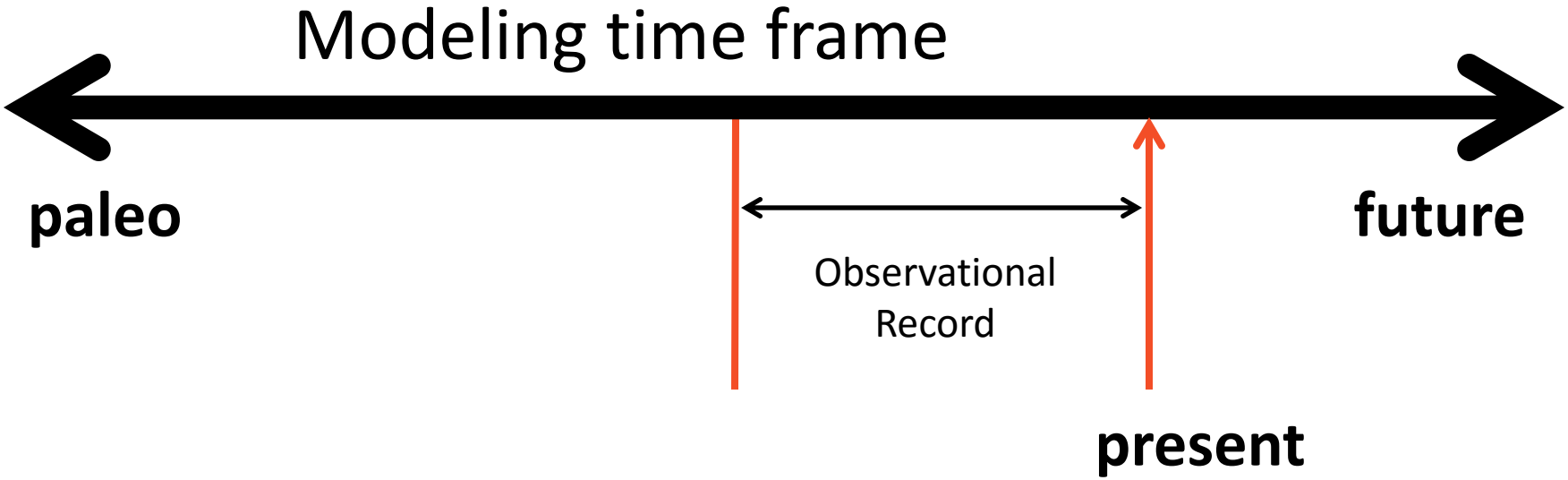
Temporal and spatial scales – a continuum of interests



Other possible continuums:

- Spatial domain…
- Processes modelled…
- Customizability…
- Model run time…

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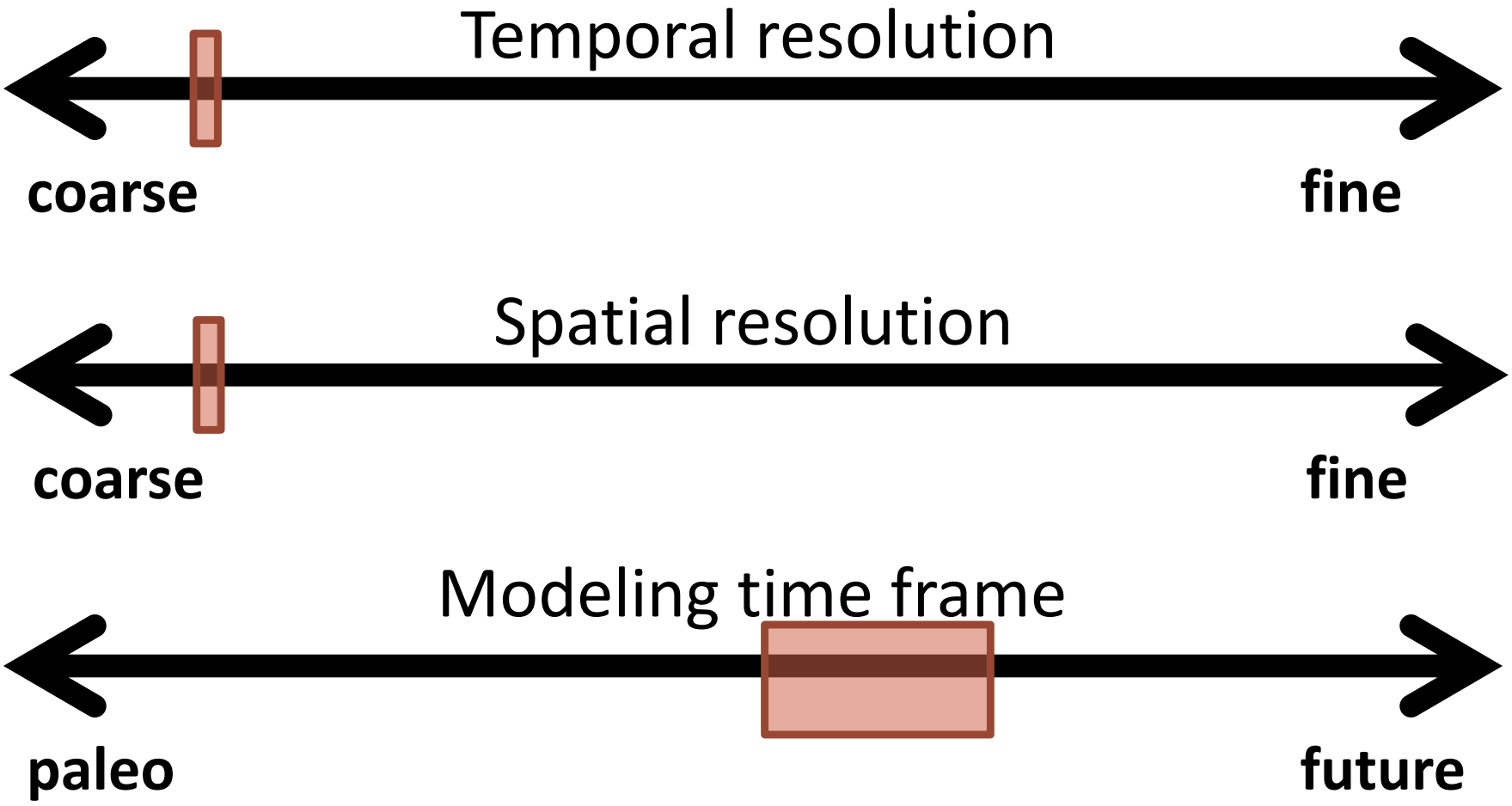
Temporal and spatial scales – a continuum of interests



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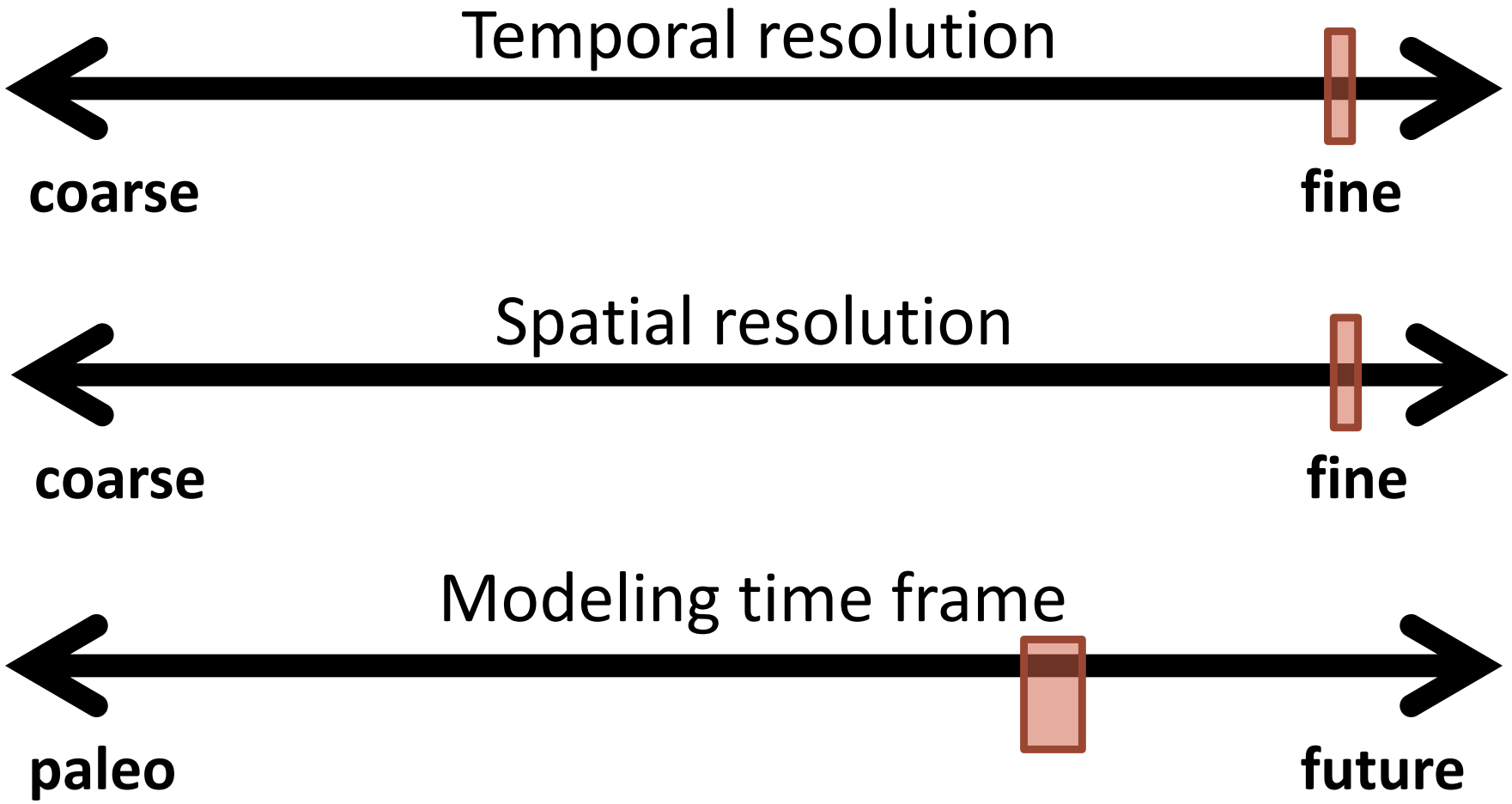
Temporal and spatial scales – a continuum of interests



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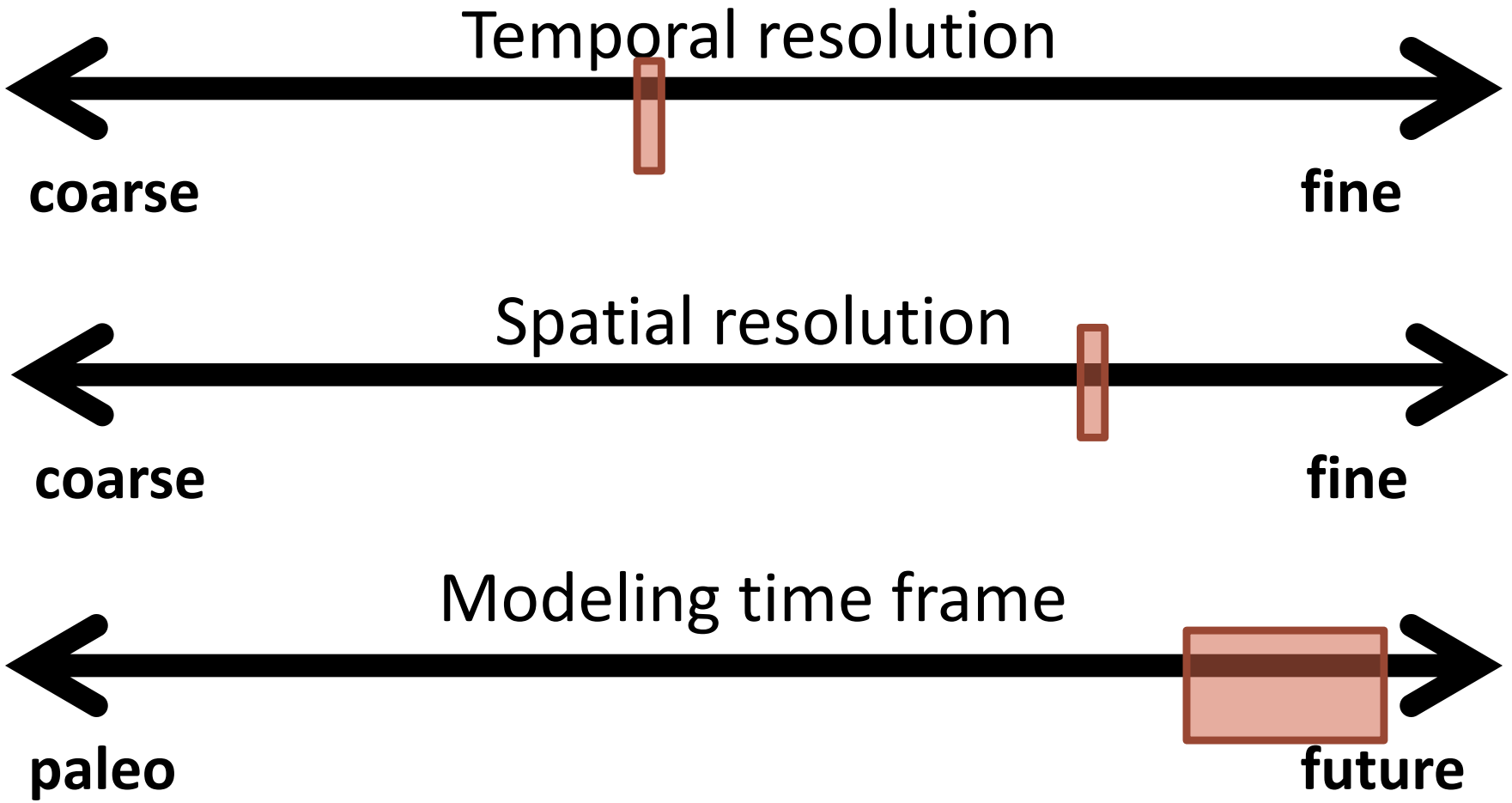
Temporal and spatial scales – a continuum of interests



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WHY DO WE MAKE ESTIMATES?

Impossible to install a gage everywhere we need streamflow information.

Models are also used to simulate:

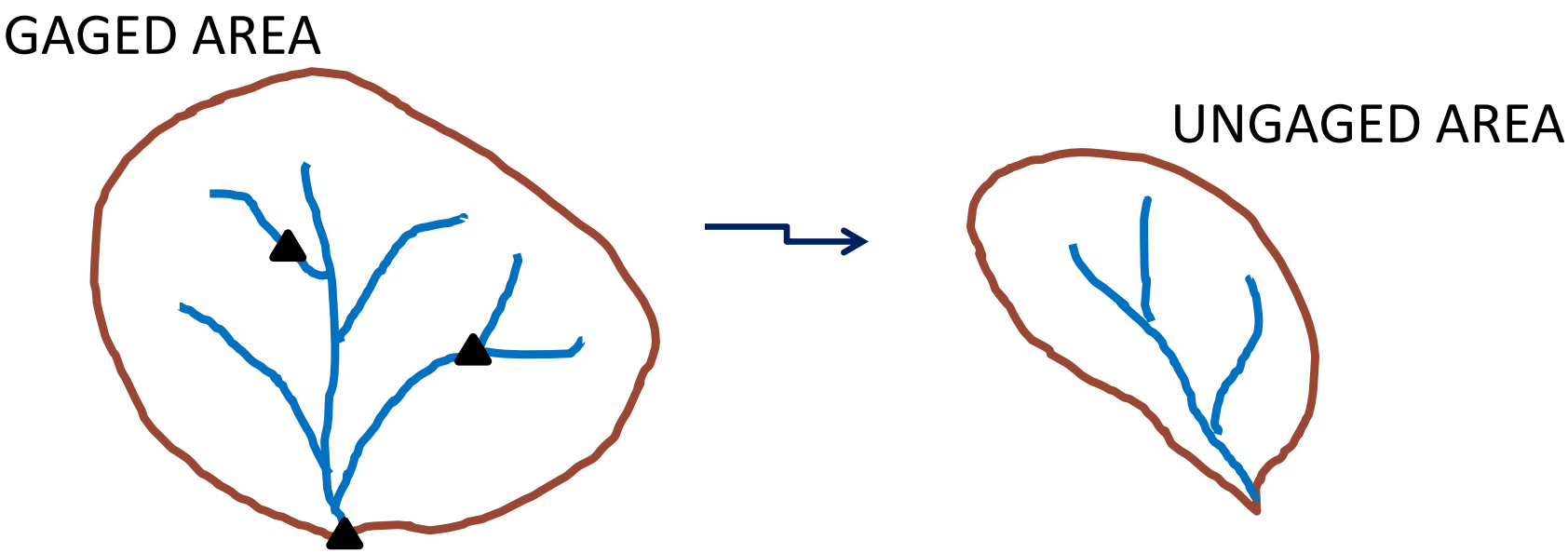
- hypothetical changes (e.g., new water resources policy, land development, climate change)

- past conditions (e.g., before humans influenced the system)

HOW DO WE MAKE ESTIMATES?

Transfer information from streamgages

A key assumption is that the study area has gaged catchments which are ***similar*** in some way to the ungaged locations.



Does our network provide a sufficient number of donor gages for a successful transfer of information?

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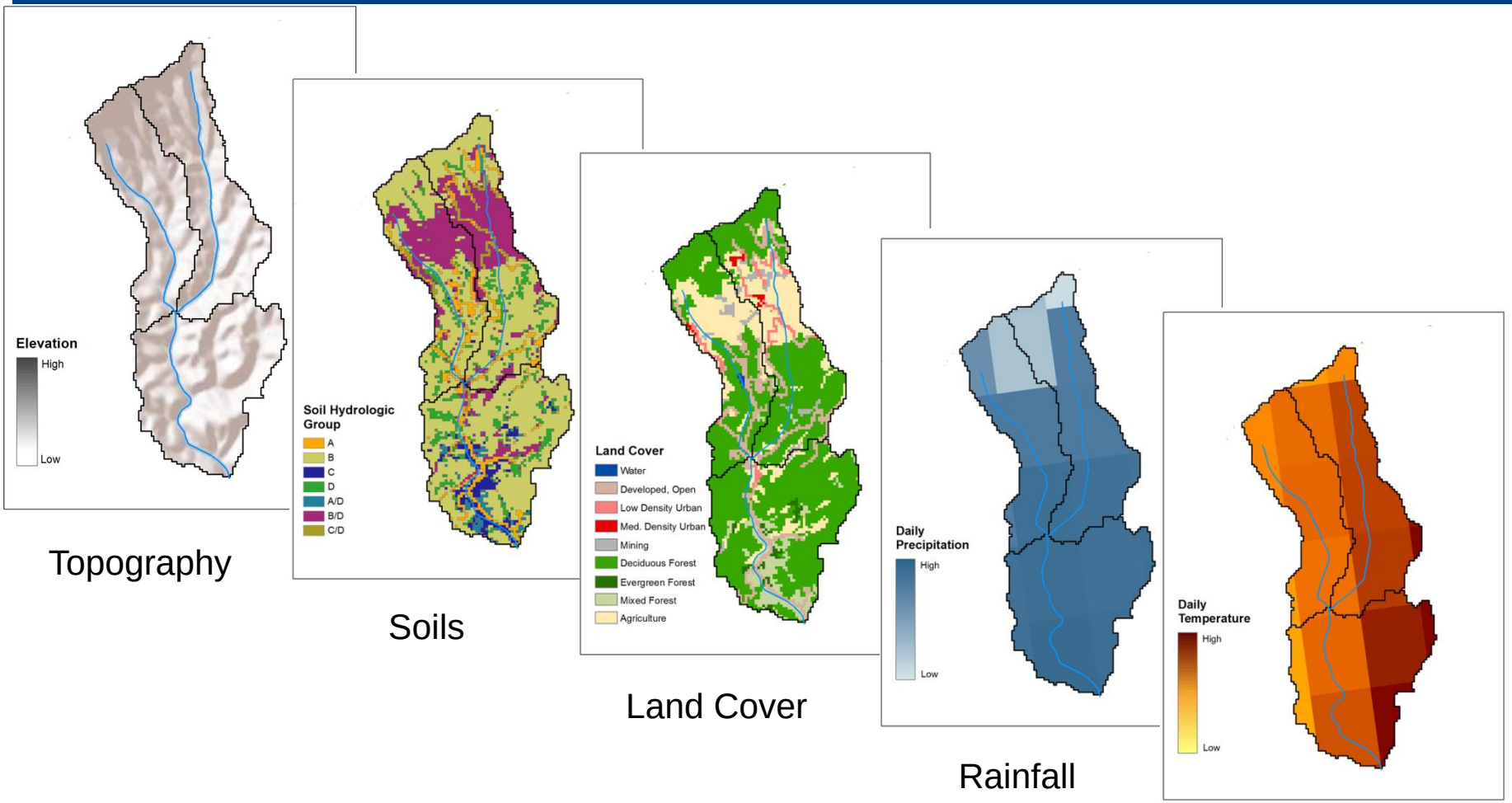
Similarity is needed in terms of other needed inputs



Topography

Soils

Land Cover

Rainfall

Temperature

Statistical models

Regression models:

Flow statistic = f(basin chars)

Geospatial techniques:

Kriging – sophisticated interpolation

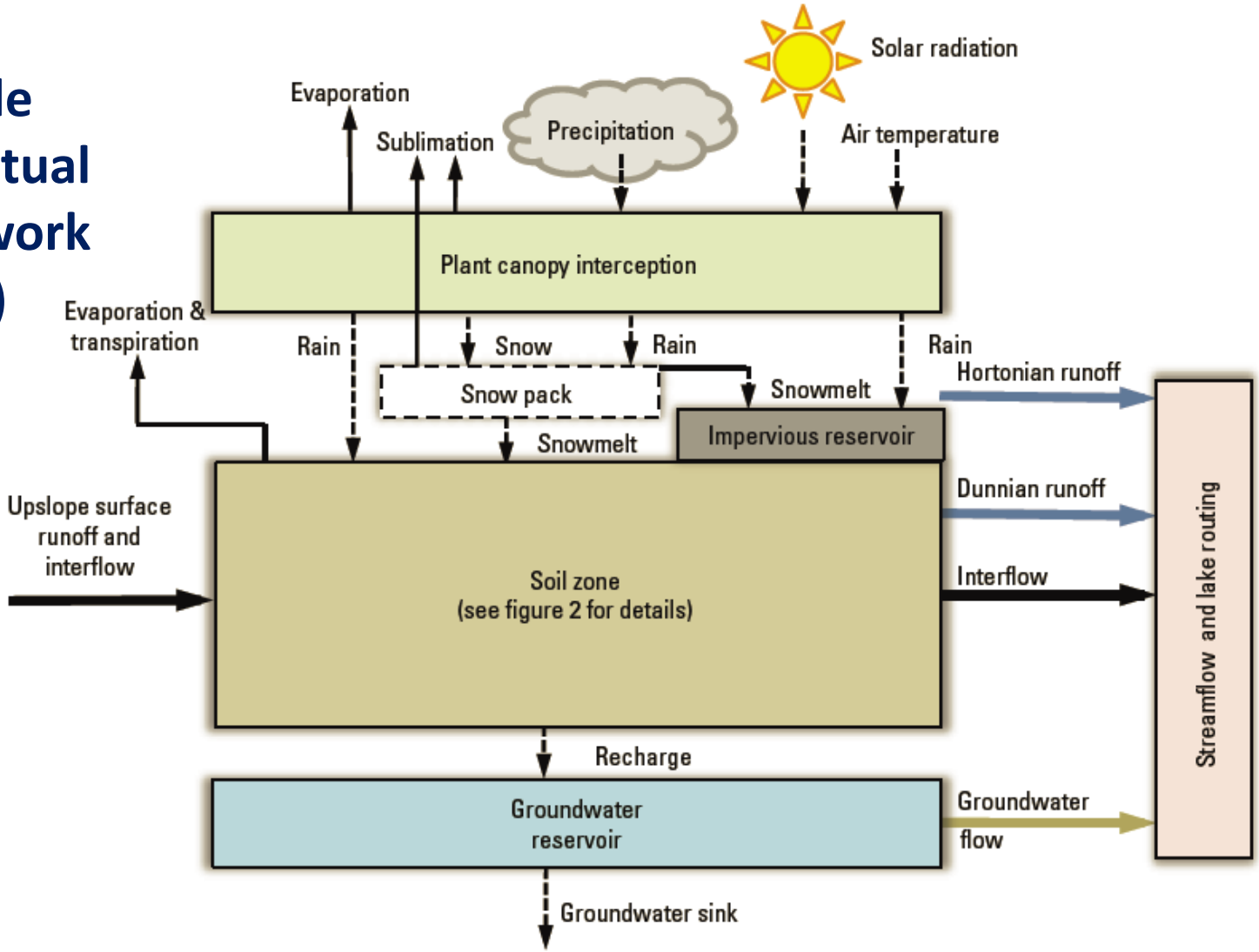
Machine learning:

Classification, clustering, pattern recognition

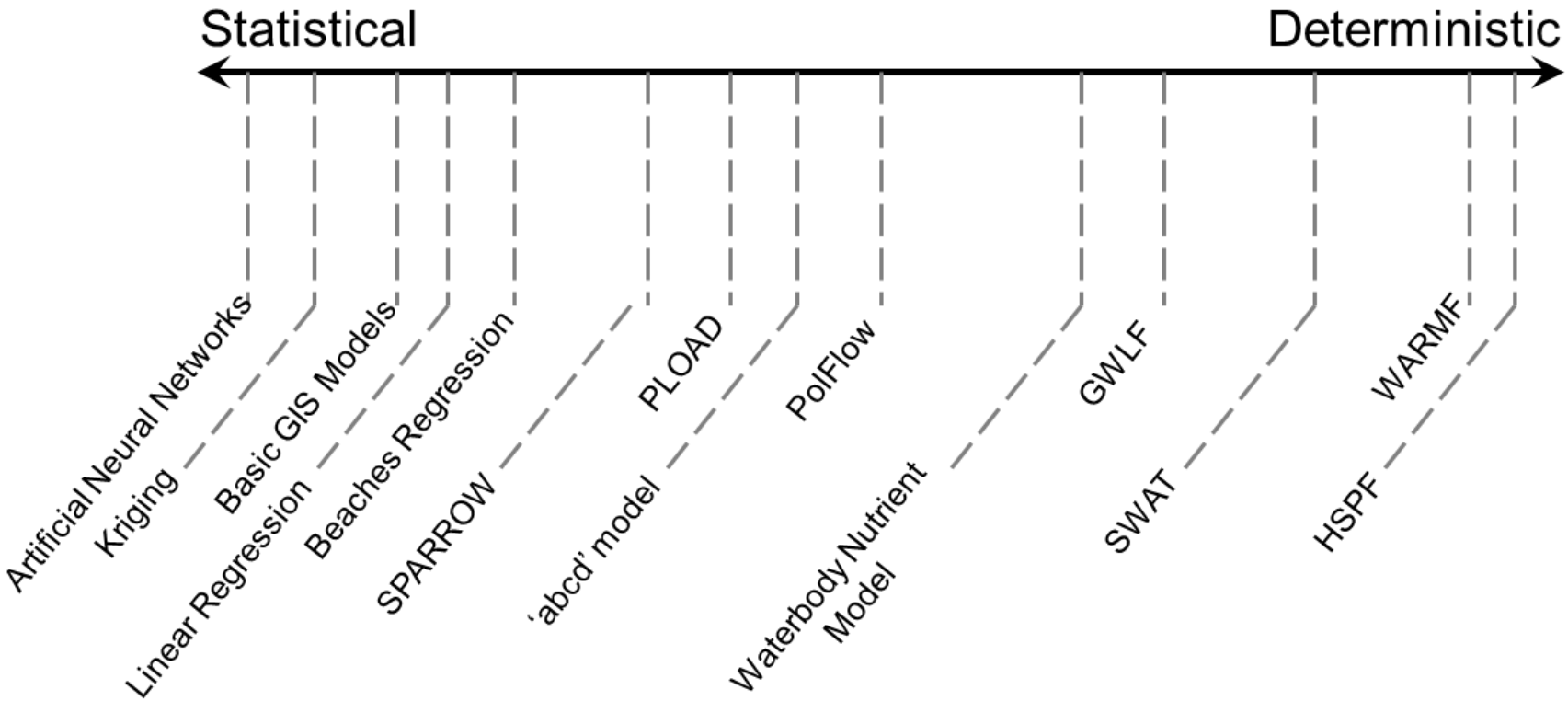
Deterministic models

Model the processes of runoff generation and water storage.

Example conceptual framework (PRMS)



Statistical vs Deterministic Methods



Source: Modified from Schwarz et al., 2006

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THE STREAMGAGE NETWORK MATTERS…

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Model performance: Some factors to consider

- Heterogeneity in the landscape and within watersheds
- Non-reference streams: accounting for upstream alterations
- Changing land use and climate in the watershed

-Availability of gages for calibration/validation

-Accuracy of streamgage record used for calibration/validation

-Variability in streamflow

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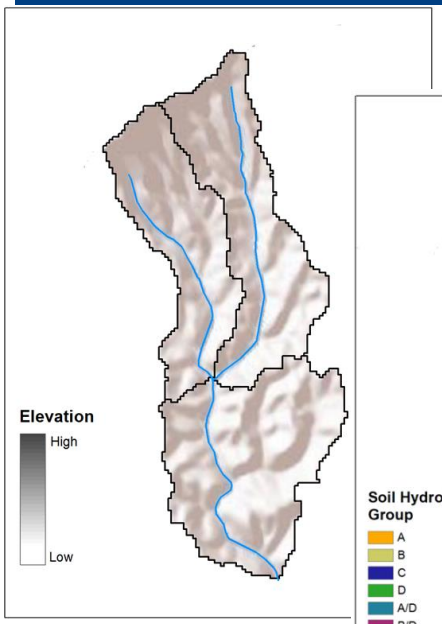
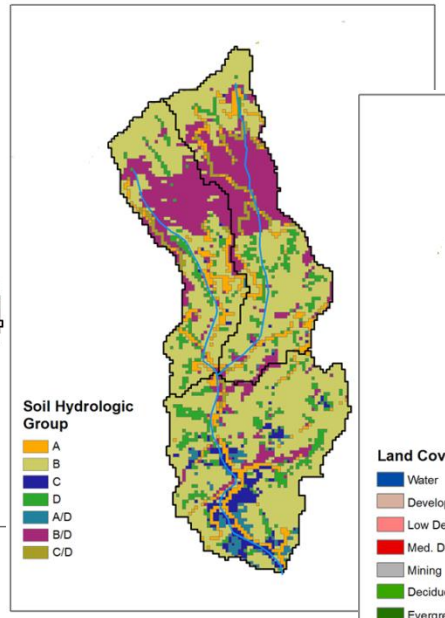
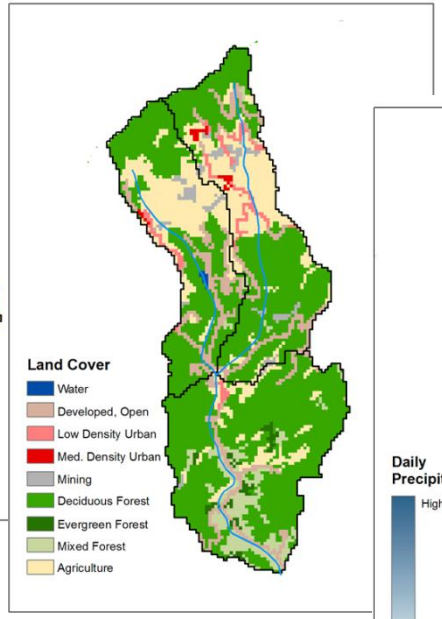
Similarity is needed in terms of other needed inputs



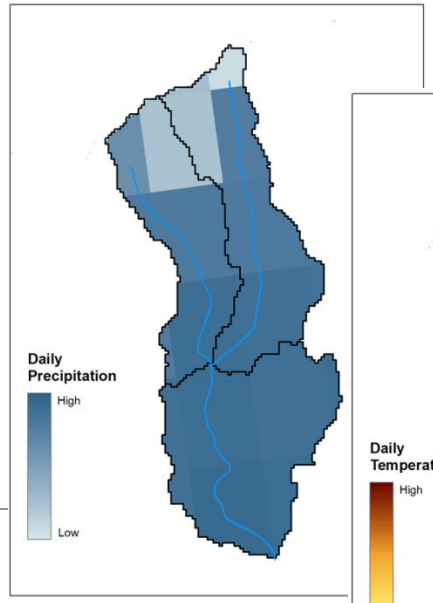
Topography



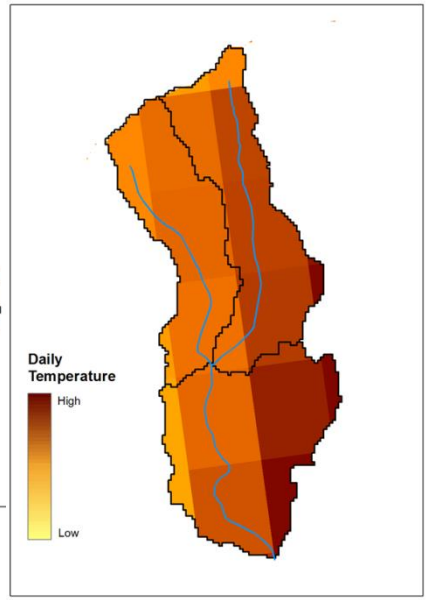
Soils



Land Cover

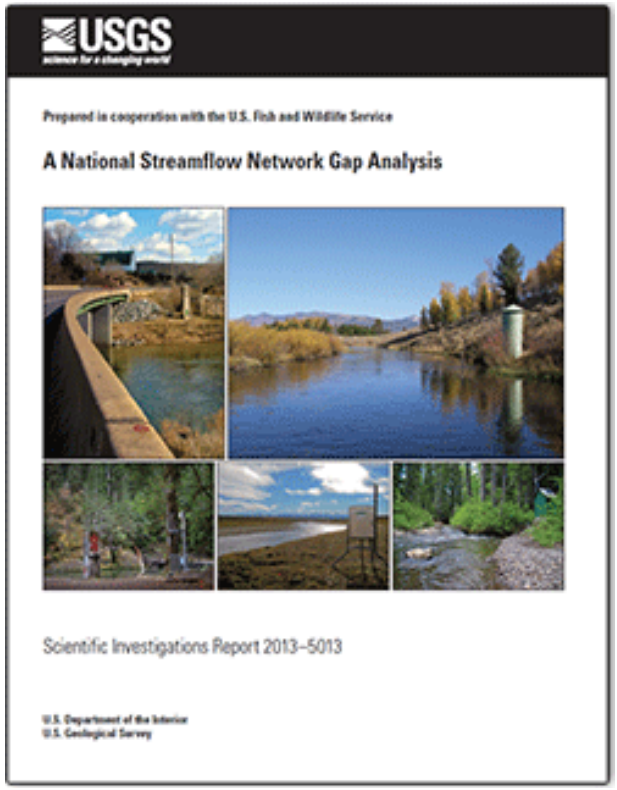


Rainfall



Temperature

Previous work



http://pubs.usgs.gov/sir/2013/5013/

- **Does the network allow estimation of flow statistics or time series at ungaged locations?**
- **Where are there gaps for this purpose?**

NOT evaluating questions such as

- Does network provide data at key locations for flood control, reservoir operations, water supply, etc.?
- Does network provide data needed for improving science of hydrology?

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